



GOLDENEAR TRITON REFERENCE

Reviewer greg borrowman

LOUDSPEAKERS

GoldenEar's Triton Reference is this US company's flagship model. It was originally going to have a six-figure price tag, but it was apparently decided that this price would not be in keeping with the company's motto, which is "*We make high-end affordable*".

Yet despite the reduction in resources necessitated by having to build to a selling price less than one twentieth that of the original figure, GoldenEar has still managed to pack more technology — and more drivers, and more amplifiers — into the Triton References than most other speakers selling for two to ten times the price. So it wasn't too surprising that at its very first outing (CES 2017) GoldenEar's Triton Reference picked up its first industry award (for Design and Engineering).

THE LOUDSPEAKERS

The Triton Reference design is fairly unusual, by which we mean to say it is a type that is very popular with GoldenEar's engineers, but not often found in the products from other speaker manufacturers. That's because it's partially active and partially passive... a so-called 'hybrid' design.

Most loudspeaker manufacturers who build active speakers (where one or more amplifiers are built into the speakers) tend to make their speakers completely active, so there is no need to use an external amplifier at all... indeed that's one of the active design's biggest selling points... buyers don't have to fork out for an expensive amplifier! The GoldenEar Triton Reference has an amplifier built in (two, actually...one in each cabinet), but those amplifiers only power the multiple bass drivers in each cabinet. You still need to use an external stereo amplifier to provide power for the midrange drivers and the tweeters (which are all passive).

GoldenEar's engineers haven't skimped on power it comes to driving the Triton Reference's bass drivers, because the amplifier in each cabinet is rated as being capable of delivering 1800 watts. This power is delivered not to one, nor two, but to three 'race-track' bass drivers, all of which are mounted on the front panel. The reason for the 'race-track' shape is that it has allowed GoldenEar to maximise the cone area on the front baffle whilst at the same time minimising the width of that baffle, which has the effect of improving both dispersion and imaging. Each of these drivers measures around 153 × 254mm, so the total radiating area is about 1650cm², which means that if GoldenEar had used just one regular circular (conical) driver to move the same amount of air, it would have required a diameter of around 381mm — in other words, there would have been absolutely zero chance of fitting such a driver on the front baffle!

One electronics issue with using three drivers is that their combined impedance is quite low if they're paralleled. For example, if GoldenEar is using three 4Ω drivers in parallel, which is likely, the combined impedance would be just 1.3Ω... a bit lower than the 'comfort zone' for most amplifiers.

This is no doubt one of the reasons GoldenEar is using its own (Class-D) amplifier to drive them. However, it isn't just a power amplifier: GoldenEar has also incorporated a DSP processor ahead of the amplifier which means it can smooth out any 'kinks' in the low-frequency response of the speaker, plus it can build in circuitry to prevent the amplifier from being overdriven... and from overdriving the speakers. Using DSP has also allowed GoldenEar to provide a bass level control so users can adjust the level of the bass to compensate for room placement, poorly recorded music and/or personal preference.

◀ THE TRITON REFERENCE DESIGN IS FAIRLY UNUSUAL, THOUGH OF A TYPE VERY POPULAR WITH GOLDENEAR'S OWN ENGINEERS.



△ IN ADDITION TO THE THREE BASS DRIVERS ON THE FRONT PANEL OF THE TRITON REFERENCE, GOLDENEAR HAS FITTED FOUR PASSIVE RADIATORS (TWO ON EACH SIDE OF THE CABINET) TO AUGMENT THE BASS RESPONSE.

This isn't as easy to do as it sounds, because the upper end of the bass drivers' response always has to integrate smoothly with the response of the midrange drivers... which is another reason for using digital signal processing, rather than trying to do it in the analogue domain. The subwoofer amplifier and the 56-bit DSP control unit inside the Triton Reference are apparently the only components inside it that were not specifically designed for it, but are instead, according to Sandy Gross of GoldenEar: *"an evolution of those used in our Triton One and our SuperSubs"*.

In addition to the three bass drivers on the front panel of the Triton Reference, GoldenEar has fitted four (count 'em!) passive radiators: two on each side of the cabinet. These are truly passive, because they are not connected to anything at all... they're essentially just flat vibrating plates. They do, however, provide additional bass output, harnessing the air pressure from the rear of the three bass drivers and re-directing it into the listening room. Each of these passive radiators measures 260 × 242mm.

The 'passive' section of the Triton Reference is comprised of two 153mm conical drivers that are mounted above and below a folded ribbon 'HFVR' tweeter in a geometry that's usually referred to as 'MTM' (midrange-tweeter-midrange)... except that in this case the 'midrange' drivers are not typical midrange drivers because they actually deliver far more bass than you'd expect from a 'typical' midrange driver. It is for this reason that GoldenEar specifically refers to them as 'upper-bass/midrange drivers'. The company says that despite the visual similarities between these drivers and those used in the lower-priced 'Triton' models, the drivers in the Triton Reference have a different cone and larger and more powerful magnets.

The 'HFVR' tweeter (the initials stand for 'High Velocity Folded Ribbon') is described by GoldenEar as being a 'ribbon' tweeter, but this is not an accurate description, since it's really nothing like the style of tweeter most audiophiles would regard as being a 'ribbon'

design. It also works completely differently to true 'ribbon' tweeters. It's actually a variant on a design patented by legendary loudspeaker pioneer Oskar Heil, who called his version an 'air motion transformer' or 'AMT'.

Heil called this tweeter design an 'air motion transformer' because of the method by which it creates air pressure variations (which the ear perceives as 'sound'). Whereas all other loudspeaker designs depend on a diaphragm (or membrane) 'pushing' and 'pulling' the air in front of it, the AMT instead 'squeezes' air between different parts of its membrane, and it's this squeezed air that causes the air pressure variations in front of the speaker. To do this, the membrane of an AMT tweeter is not flat but pleated, rather like a child's paper fan. As the pleats move towards each other the air is compressed between the two pleated surfaces, then as the pleats move away from each other, the air is rarefied, and it's in this way that the high-frequency sound waves are created. The pleats in the membrane are super-efficient at moving air (think of the difference between 'squirting' an orange pip away from you by squeezing it between your fingers, compared to throwing the pip with your hand). Also, because the pleated membrane is inherently 'loose' it has a resonant frequency that's well outside its operating range, which isn't true of, for example, dome tweeters... and especially untrue of hard-dome tweeters!)

Because Oskar Heil's AMT patent has expired, all loudspeaker manufacturers are free to create their own versions of his tweeter... which, because of its superior performance, a great many have done. However, they can't use the letters 'AMT' to describe the tweeter, because these are trademarked. It's for this reason that GoldenEar calls its version an HFVR. Other well-known versions of Oskar Heil's design are made by Elac (which calls its version 'JET'), Precide Audio (which calls its version 'AVT'), Adam Audio (ART), and Sorasound (FAL).

Adam Audio has a particularly clear description of how the tweeter works on its website that's rather more technical than my explanation. It says: *"All other loudspeaker drive units — whether they are voice-coil driven, electrostatics, piezos or magnetostatics — act like a piston, moving air in a 1:1 ratio. This is undesirable, as the specific weight of air is much lower than that of the driving mechanics. Speaking in terms of electrical engineering one could say there is a bad match between source and load. The [air transformer] principle achieves a 4:1 velocity transformation between (the) driving diaphragm and the driven air. In other words, the air moves in and out four times faster than the folds are moving. This superior motor system is responsible for the enormous clarity and transient reproduction..."*

▽ THE 'HFVR' TWEETER (THE INITIALS STAND FOR 'HIGH VELOCITY FOLDED RIBBON') IS DESCRIBED BY GOLDENEAR AS BEING A 'RIBBON' TWEETER.



Although GoldenEar uses 'HFVR' tweeters in other of its models, according to Sandy Gross the neodymium magnet in the version fitted to the Triton Reference is a 50 per cent larger — and thus more powerful — than the magnet in any other GoldenEar HFVR tweeter. He says this results not only in an increase in efficiency, but also an improvement in its transient response. Other refinements in the Triton Reference that are not available in other GoldenEar models include film capacitors to bridge the high-pass section on the upper-bass/midrange drivers.

Visually, the most obvious difference between the Triton Reference and previous Triton models is the external finish of the cabinet. Whereas GoldenEar usually favours the rather cost-effective method of finishing its speakers by covering a raw wooden cabinet with black cloth, it's pulled out all the stops with the Triton Reference, which has a beautiful hand-rubbed piano-gloss black lacquer finish. The speaker bases are not only curved front-to-back — the base itself is higher close to the cabinet, so it curves down as it moves away from the cabinet. All the corners on the cabinets are curved, but the curve at the top edges is more pronounced than the curves from the sides to the back or from the top to the back.

Internally, there are other differences between the Triton Reference and other Triton Series models. The cabinet itself is damped with a newly-developed and apparently proprietary mix of long-fibre lambs-wool, plus it has a 2.5mm-thick steel plate built into the base which not only stiffens it, but also lowers the centre of gravity, and thus gives the cabinet increased resistance to any side-forces that might topple it — which is important for tall speakers with small footprints... which certainly describes the Triton Reference to a 'T'. (Speaking of which, GoldenEar's employees have apparently dubbed the Triton Reference the 'T-Ref' for short... a moniker so quirky it might just catch on.)

LISTENING SESSIONS

Visually, these are imposing speakers. We thought the black looked gorgeous, which is just as well, because they only come in black — there are no other colour options. The side-firing passive radiators mean the speakers will be very forgiving of less-than-ideal room placements, plus also mean you will be able to put these speakers closer to a rear wall than speakers that have rear-firing drivers and/or ports... though placement at least one metre from a rear wall will almost always result in the best sound.

Despite the addition of weight at the bottom of the cabinet, and the large base, the Triton





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Reference is still not overly stable if you give the cabinet a good push from either side... though it's very stable front-back. This front-back stability is good, because we found that for perfect imaging the tweeters need to be aimed at the listening position, which means tilting the cabinets forward a little by adjusting the spikes in the base and toeing the speakers inwards. The further away your listening position from the speakers, the easier this will be to accomplish. But if you can't quite manage this ideal, you'll still get excellent imaging... just not perfect imaging. The sonic balance is the same in this situation, but the stereo image will snap into focus when the tweeters are aimed directly at your head.

Our first-up listening task was to establish the best setting of the volume control on the rear of each speaker, and an excellent work to use for this task is 'Who's Got Its Own?' (Stazioni Sonore) where you can balance Nicola Vernuccio's beautifully-mic'd double-bass against Claudia Tellini's stunning voice using such tracks as *Money* (Roger Waters) or *Mountain O' Things* (Tracy Chapman). Once achieved, we simply revelled in the exquisite tonal delivery of the double-bass's sound, all 'stringy' and 'depthy' and with just the appropriate amount of 'woodiness'. The Triton Reference delivered the bend of the strings and the sound with an exactitude that was truly uncanny.

That the Triton References' frequency response is not only flat across the midrange but also truly flat and extended at both ends of the audio spectrum was immediately made evident when we played Glenn Gould's 1981 recording of Bach's *Goldberg Variations*, where he not only artistically re-imagines the work completely from his 1955 reading, but also has mastered the art of extracting the exact sound from his piano that he wanted (not only from the piano itself, as regards tuning, but also the sound of the recording of that piano). We found that the GoldenEars perfectly delivered what Gould intended, with exactly the correct pianistic tonality and a beautiful balance of the lower octaves against the upper. Where Gould plays staccato, the GoldenEars respond instantly and exactly, no matter how hard Gould attacks the keyboard (and he could be very brutal). In such moments we heard no signs of overload or distortion, and each note started and stopped at exactly the right time, demonstrating both the superb transient response of the drivers and the suspensions' control of them, to prevent overhang. It can sometimes be difficult to hear the more subtle shading Gould uses in his playing, but with the Triton References that wasn't an issue — even the subtlest shading was perfectly audible... and it's this that lifts Gould's performance to the highest echelons.



Van Der Hoeven explores the lowest notes of his double bass on this album, and the GoldenEars follow downwards in pitch with unerring obedience

The ability of the GoldenEars to play both deeply and loudly at the same time really came into play when we played well-recorded pipe organ works, in particular our favourite Jean Guillou disc on Dorian, where he plays the Great Organ of Saint Eustache, in Paris. This disc has some of the lowest musical frequencies ever recorded... notes that you'll not only hear when you audition the Triton References, but will also feel — particularly if you crank up the volume. The low-frequency energy created in the room is such that you may have to Blu-tac small objects in your room to the shelves they're standing on in order to prevent them from vibrating off! But it isn't only power and majesty at these high volume levels — just listen to the way the Triton Reference reproduces the delicate stopped sounds on Mozart's *Fantasy in F Minor* (K608).

As for potential maximum volume levels, we were listening in a large room 5.5 metres by 10 metres with a 3.0-metre ceiling — and with 300-watts per channel at our disposal — and we were regularly cracking sound pressure levels of more than 100dB SPL at the listening position, during which times the Triton References sounded just as clean and sweet as when we were playing *pianissimo* down in the low 70dBs.

We used a 300-watt per channel amplifier, but the fact that the Triton References' own amplifiers are doing all of the heavy lifting in the bass means you could easily get away with using a much lower-powered amplifier and achieve exactly the same result.

The GoldenEar Triton References handle sibilants beautifully. On Janis Ian's most recent digital remaster of her song *Stars*, for example, all the 'ess' sounds (and there's a lot of them on a song called *Stars*!) can sound a bit too sibilant on speakers that are overly articulate, yet played on the Triton References the sibilance was certainly there (it's on the original analogue tapes, after all) but it's not emphasised at all... it just has you thinking to yourself: 'If only she'd moved back a little from the microphone.' Although *Stars* is a favourite track for testing a loudspeakers' ability with sibilants, we can't ever play it without following up with *At Seventeen*, not just because of the quality of the song-writing, but also for the purity of Janis Ian's vocal, which was reproduced with delightful accuracy by the Triton References.

Listen carefully to the backing on this track and you'll also clearly hear some unwanted fretboard squeaks that aren't as audible on lesser speakers, so you can be assured that the GoldenEars are 'telling it like it is' and not glossing over imperfections in recordings.

Listening to the Triton References playing Jethro Tull's classic 'Thick as a Brick', the percussion

sound was a standout throughout, and the height of the speakers helped in delivering a soundstage that was not only wide and deep but also had realistic height, so you could actually hear the hi-hat sound as issuing from 'above' that of the rest of the kit.

The dynamics of flamenco are a superb test for any loudspeakers, not just for the guitar sound, but also for the hand-clapping and the percussion. One of the best recordings we've ever heard is of Carlos Heredia on the album 'Gypsy Flamenco', recorded by Bob Katz for Chesky. Close your eyes and you can almost visualise the 'palmas' (hand clappers) at the side of the stage. If this recording has a fault, it's that the acoustic is more 'live' than you would hear when you're actually listening to flamenco live — either in-doors in small or large venues... or even outdoors. I guess it wasn't practical for Chesky to make the recording with a live audience to soak up the echoes... and the high-frequency purity of the Triton References is such that you hear all these echoes very clearly.

When it was time for something completely different (as the Pythons would say), we turned to Abbe May's 'Kiss My Apocalypse', which was a great test of the Triton References' powered bass section, thanks to the extensive use of synthesised bass on this album, not to mention the extensive use of synthesisers and drum machines. Listening to the machine-gun-like bass in the track *T.R.O.U.B.L.E.* via the GoldenEars was like listening to an alternate reality.

The sound of a violincello is a great test for any loudspeaker, and Maya Fridman plays cello like you've never heard it before. Pianist Atzo Kohashi says of it: "When I first listened to Maya's cello playing, I was intrigued by its hue changes — various shades and colours... her cello sometimes sounds like Albert Ayler's saxophone and sometimes just like a human crying."

The two musicians team up with Frans Van Der Hoeven (double bass) on the album 'Elegy', which is a sonic miracle... and you can hear just how miraculous it is when listening to it using the GoldenEar Triton References. The cello sound in Carla Bley's *Utvikingsang* is from another world entirely, its high frequencies so high as to be almost beyond human hearing, and reproduced sublimely by the Triton References. Van Der Hoeven also explores the lowest notes of his double bass on this album, and the GoldenEars follow downwards in pitch with unerring obedience. Piano sound, reproduced a single note at a time (via a Prosonus Test Disc), showed the GoldenEar Triton Reference's frequency response to be very flat right across the entire 88-note range of the grand piano.

We put this enviable linearity to a more musical test by playing Simone Dinnerstein's magnificent performance in Berlin at the Philharmonic, captured for posterity on 'The Berlin Concert' (Telarc CD-80715). She delivers a stunning rendition of Bach's *French Suite No 5 in G Major* (the Gavotte of which is one of the most joyous pieces of music you'll ever hear).

Her performance of Beethoven's *Piano Sonata No 32 in C Minor* is also pretty special. Telarc's engineers did a superb job with this recording, managing to capture the exact sound of the hall's Steinway, as well as that of the acoustic of the hall itself. Both are delivered to perfection by the Triton References. Turn off the lights, relax and you could be in the hall itself (though not in a seat, mind you, but floating in the air where the microphones were positioned).

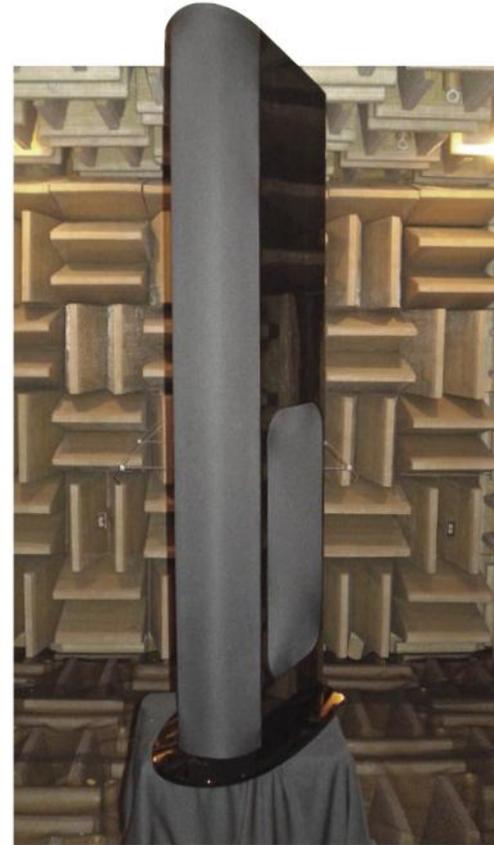
Great audience too. You don't even hear them until they start clapping. (And the sound of that applause is exactly true-to-life as well.) Listen also to the sympathetic resonances of strings that haven't actually been struck, but are simply resonating because of the lyre of the piano and other strings alongside them — all of which deliver the sound of a 'real' piano into your room, and the Triton References do this as well as any speakers we've ever heard.

The GoldenEar Triton References delivered Leonard Cohen's gravelly baritone on *Chelsea Hotel #2* with the same distinctive timbre we've experienced in his earlier live performances, yet is one that eludes lesser loudspeakers. On *Take This Longing*, the sound of the bass lines are outstandingly good, as are the tonalities of the various guitars. The intakes of breath on *Famous Blue Raincoat* are so realistic that it was almost as if there was someone hiding behind the right speaker... something that's almost possible: they're that big!

CONCLUSION

It seems strange to be saying it of a pair of loudspeakers with the sticker price of the GoldenEar Triton References, but they really do live up to GoldenEar's famous claim of 'making the high-end affordable', because they are truly 'high-end' loudspeakers, and although they are expensive, they are far, far more affordable than almost all their high-end competitors, plus they also sound a whole lot better than many of them as well.

GoldenEar's biggest problem is going to be how to convince someone who has already planned on buying one of the 'big-name' high-end loudspeaker brands to give the Triton References an audition before doing so. We can only hope this review encourages them... and that's you, dear reader... to do just that. 



SPECIFICATIONS

GOLDENEAR TRITON REFERENCE

FREQUENCY RESPONSE:

12Hz–35kHz

EFFICIENCY: 93.25dB SPL

IMPEDANCE: 8Ω (Nominal)

BUILT-IN SUBWOOFER

POWER: 1800 watts

DIMENSIONS (WDH):

343 × 565 × 1474mm

BASE DIMENSIONS (WD):

345 × 564mm

WEIGHT: 49kg

PRICE: \$15,495 per pair (RRP)

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